Small Business Innovation Research/Small Business Tech Transfer

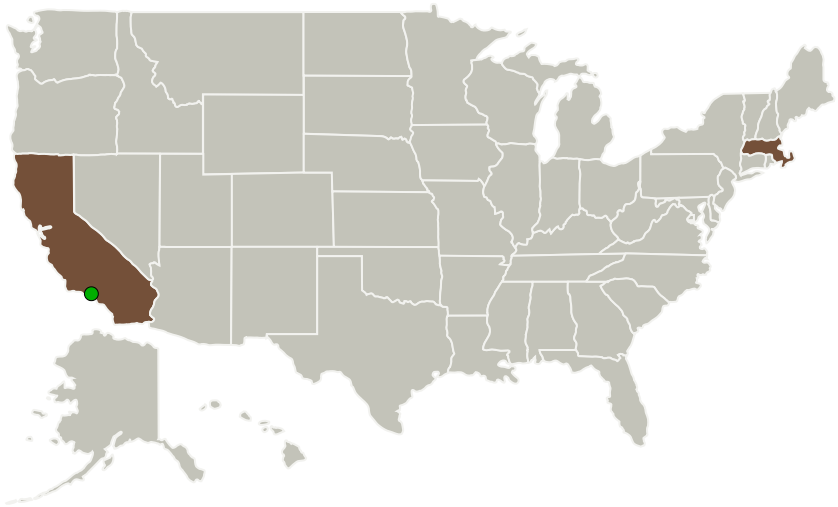
Single Crystal Piezoelectric Stack Actuator DM with Integrated Low-Power HVA-Based Driver ASIC, Phase I

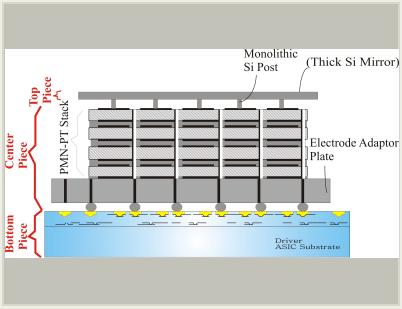
Completed Technology Project (2015 - 2015)

Project Introduction

This SBIR Phase I project aims to develop an innovative batch fabrication technique to create single crystal PMN-PT stack actuator deformable mirrors (DM) at low cost of up to one order of magnitude reduction to those offered by the state of the art manufacturing techniques. The method, being applicable to produce high-performance deformable mirrors with a large variety of pixel densities and actuator counts, is also proposed to seamlessly integrate the DM manufacturing process with a novel low-power HVA-based driver ASIC, hence an enhancement of the proposed batch manufacturing process by reliably packaging DMs with high yield, zero failure pixel, and with high optical qualities, and on top of these offering ultra low crosstalk among DM pixels which is demanded for high-resolution mirror surface control. Low pay load, high performances, low cost, and low power, are the four keys that can lead a DM to successful implementation into NASA's high-performance systems. For lab testing, concept inspiration, and concept validation, the AO communities need high-performance but low-cost DMs to study wide variety of AO concepts on a tight budget and in a timely fashion; on the other hand, once an AO concept is approved, a space-based adaptive optics system will additionally demand low payload and low power dissipation for space-based deployment. The proposed DM manufacturing and ASIC integration technique aims to develop DMs to meet the two staged needs through one joint DM development program.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Microscale, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Woburn, Massachusetts
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

June 2015: Project Start

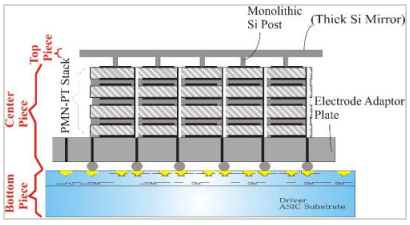
December 2015: Closed out

Closeout Summary: Single Crystal Piezoelectric Stack Actuator DM with Integrated Low-Power HVA-Based Driver ASIC, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139453)*

Images



Briefing Chart Image
Single Crystal Piezoelectric Stack Actuator DM with Integrated Low-Power HVA-Based Driver ASIC, Phase I
(https://techport.nasa.gov/image/137195)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Microscale, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

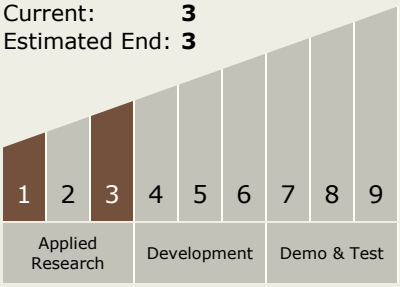
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Xingtao Wu

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System